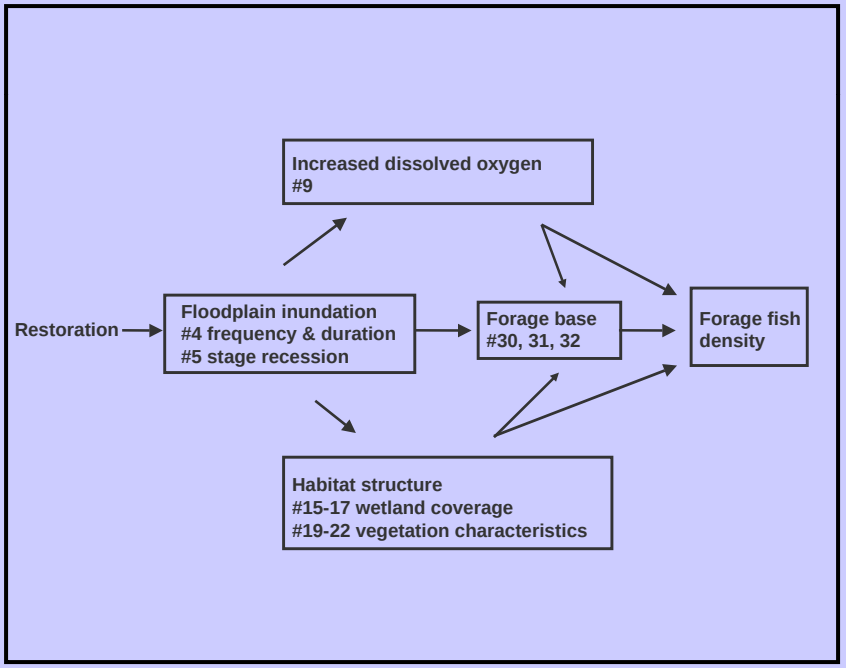
Restoring the Kissimmee River: A Successful Evaluation Program Kissimmee River Restoration Project (KRRP)

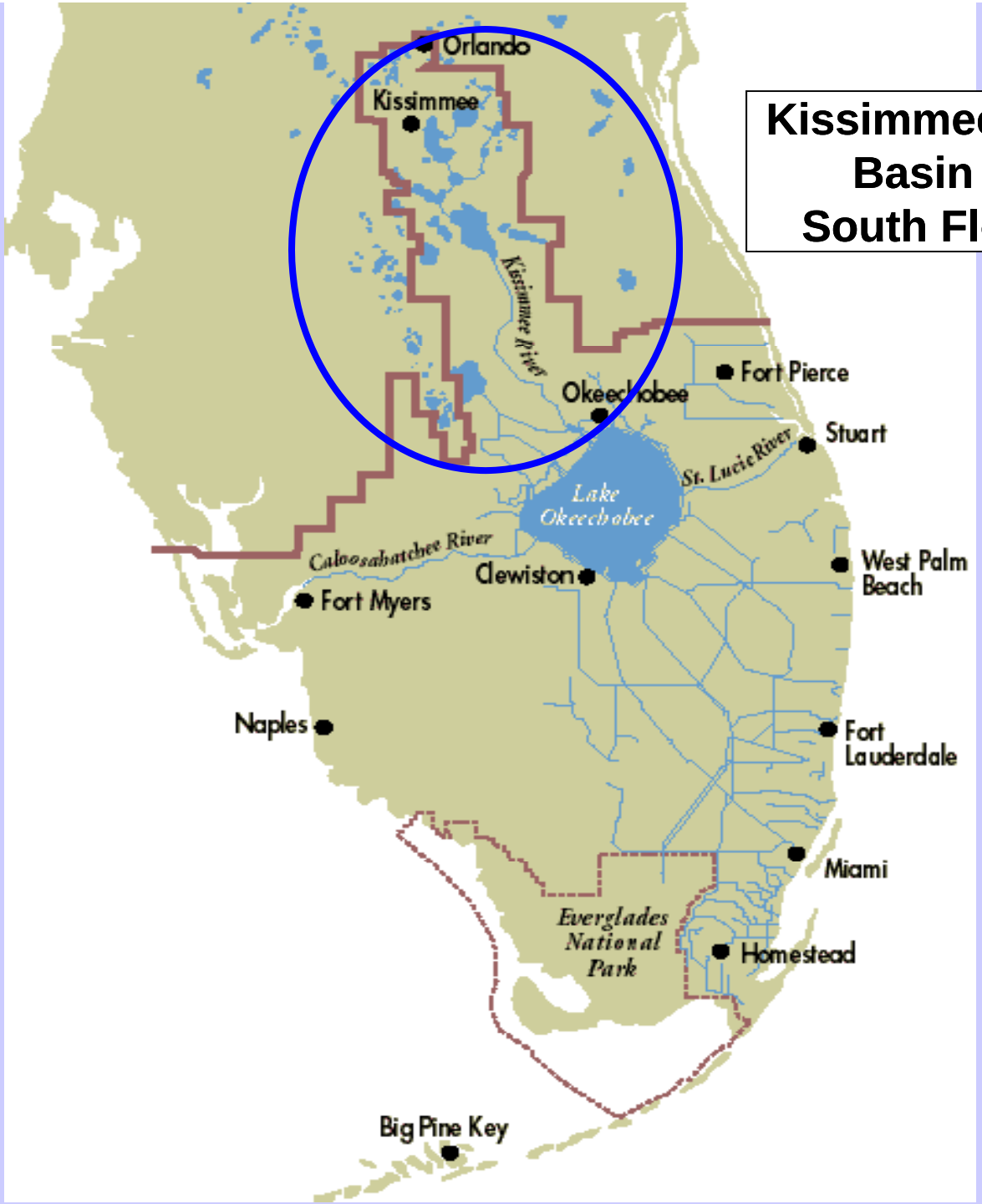
Restoration of the Kissimmee River.

?=



Applying restoration expectations.

Kissimmee River Basin in South Florida



Pre-channelized Kissimmee River – 1950s

C-38 Canal and Remnant Kissimmee River
Post-channelization circa 1980

Anatomy of the Phase I Backfilling


Historic channel
Connector run
Backfilled canal

Simple Conceptual Model

Restoration → **Abiotic** → **Biotic**

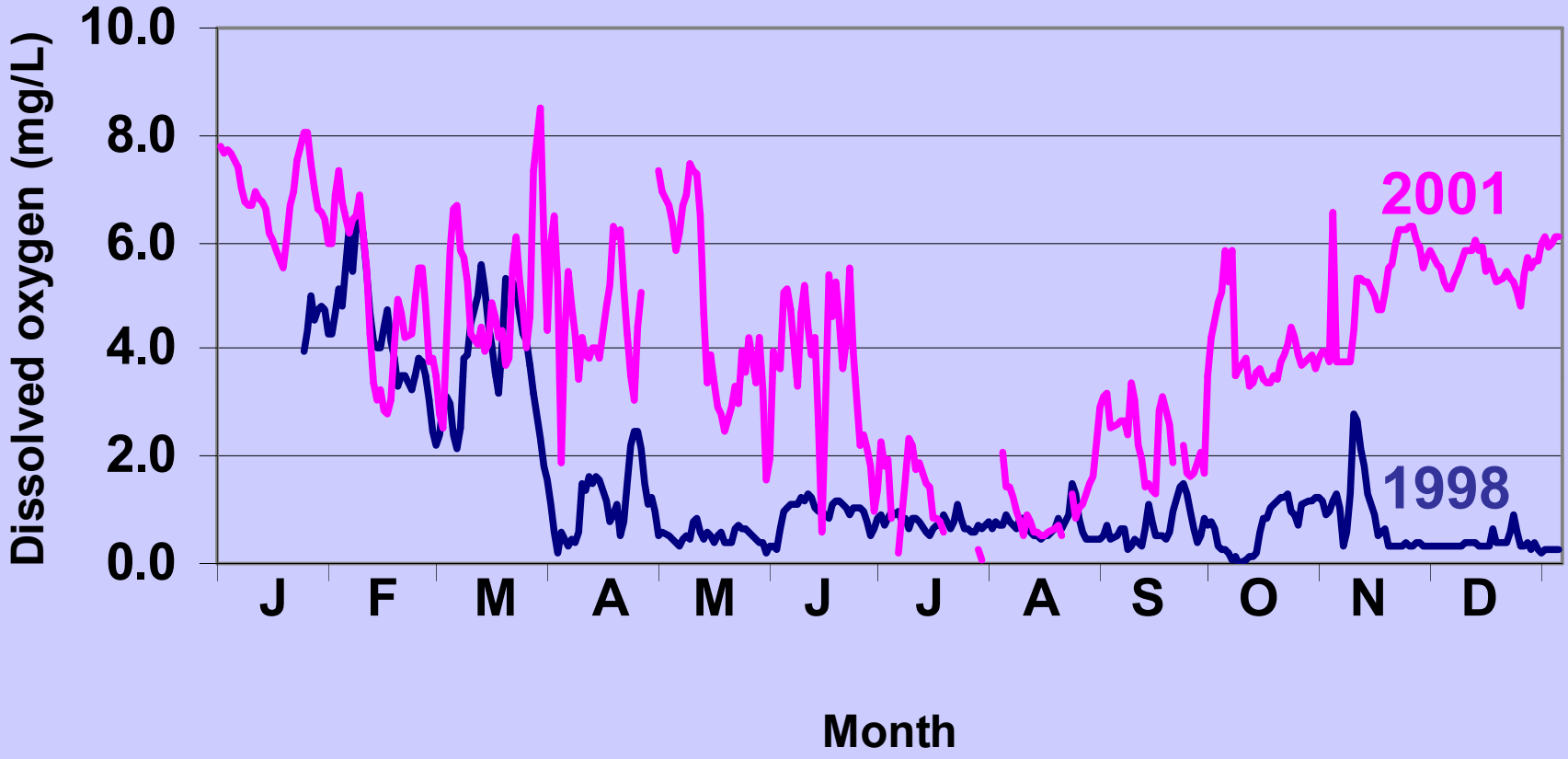
Flow

Geomorphic — **Substratum**

Hydrologic — **Dissolved Oxygen**

Hydroperiod

Algae
Plants
Invertebrates
Fish
Amphibians
Birds



Dissolved Oxygen (1 m) before (1998) and after (late 2001) restoration

60 Restoration Expectations (Metrics)

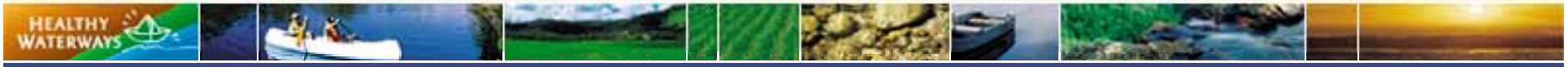
- Hydrology - 6
- Geomorphology - 2
- Water Quality - 4
- Vegetation - 10
- Invertebrates - 11
- Algae - 2
- Amphibians - 2
- Fish - 7
- Birds - 11
- Listed Species - 5

Expectations linked to an experimental design, location and frequency of measurements, methods to be used, and ways to analyze and report the resulting data.

Short Summary - KRRP

- Completed Phase I of Restoration
- So far strong positive changes in
  - River channel and wetland vegetation
  - Shore birds and overwintering birds
  - Fish communities
  - Substratum and spawning beds
  - Dissolved oxygen
- Evaluating success with clear expectations and metrics for a decade

Healthy Waterways Initiative – Southeast Queensland

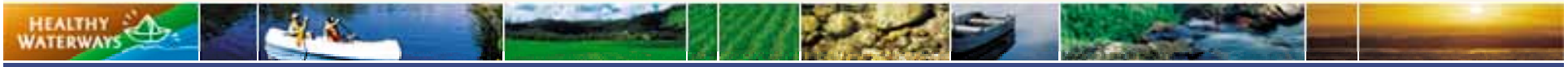


- Study region: Moreton Bay catchments in eastern Australia - most rapidly expanding population in Australia – Brisbane area
- Development of partnership (science, managers, policy makers) to deal with issues affecting rivers and coastal waterways
- Development of science and monitoring program
- Communication with stakeholders
- Implementation of actions

Background to the study region

- 15 major catchments
- 22,672 km^2
- 19 local government areas
- Population 2.5 m
- Fastest growing region in Australia

Formation of the Partnership

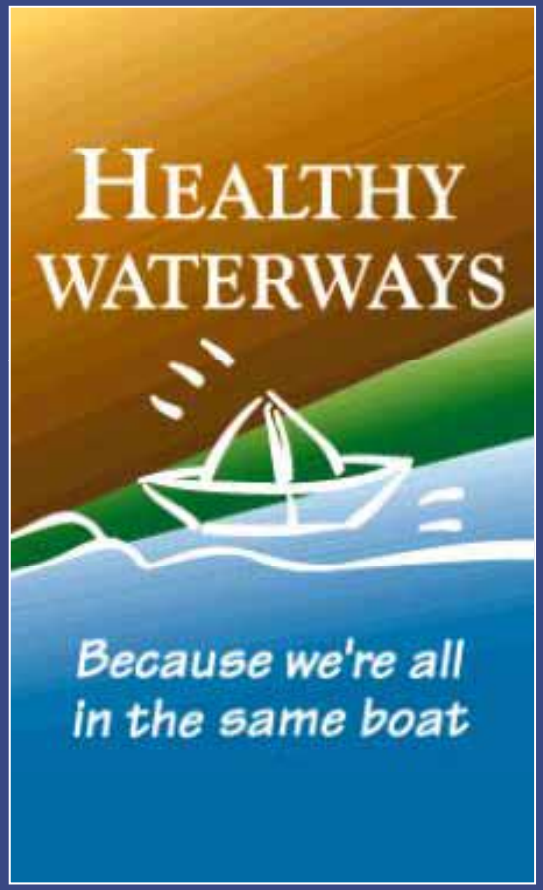


3 levels of government

- Local councils (6; 19)
- State Government agencies (6)
- plus Federal funding

Strong research support

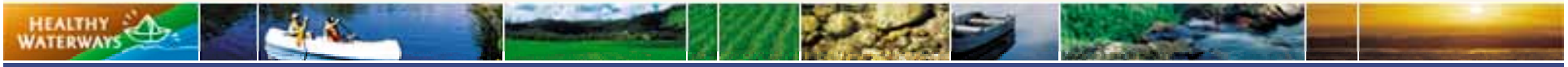
- 3 Universities
- CSIRO
- 3 Cooperative Research Centres



Community & industry advisory groups (>40)

- indigenous
- conservation
- catchment & landcare
- commercial industry
- rural industry

Developing a common vision:



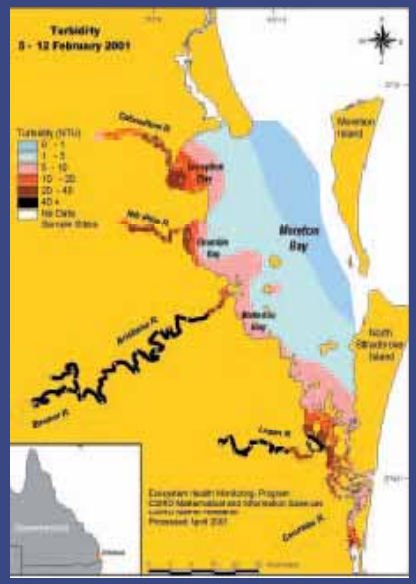
"South-east Queensland's catchments and waterways will, by 2020, be healthy living ecosystems supporting the livelihoods and lifestyles of people in South-east Queensland and will be managed in collaboration between community, government and industry."

Ecosystem Health Monitoring Program (EHMP)

Assess effectiveness of environmental protection measures (e.g. stormwater controls, STP upgrades, riparian vegetation)

Estuarine and marine EHMP
- Designed stage 2
- Implemented Stage 3

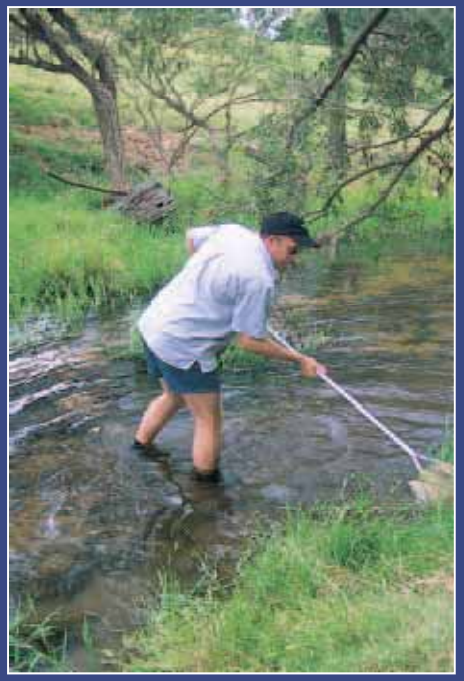
260 sites (sampled monthly)



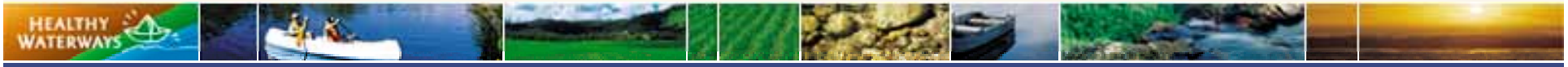
Ecosystem Health Monitoring Program (EHMP)

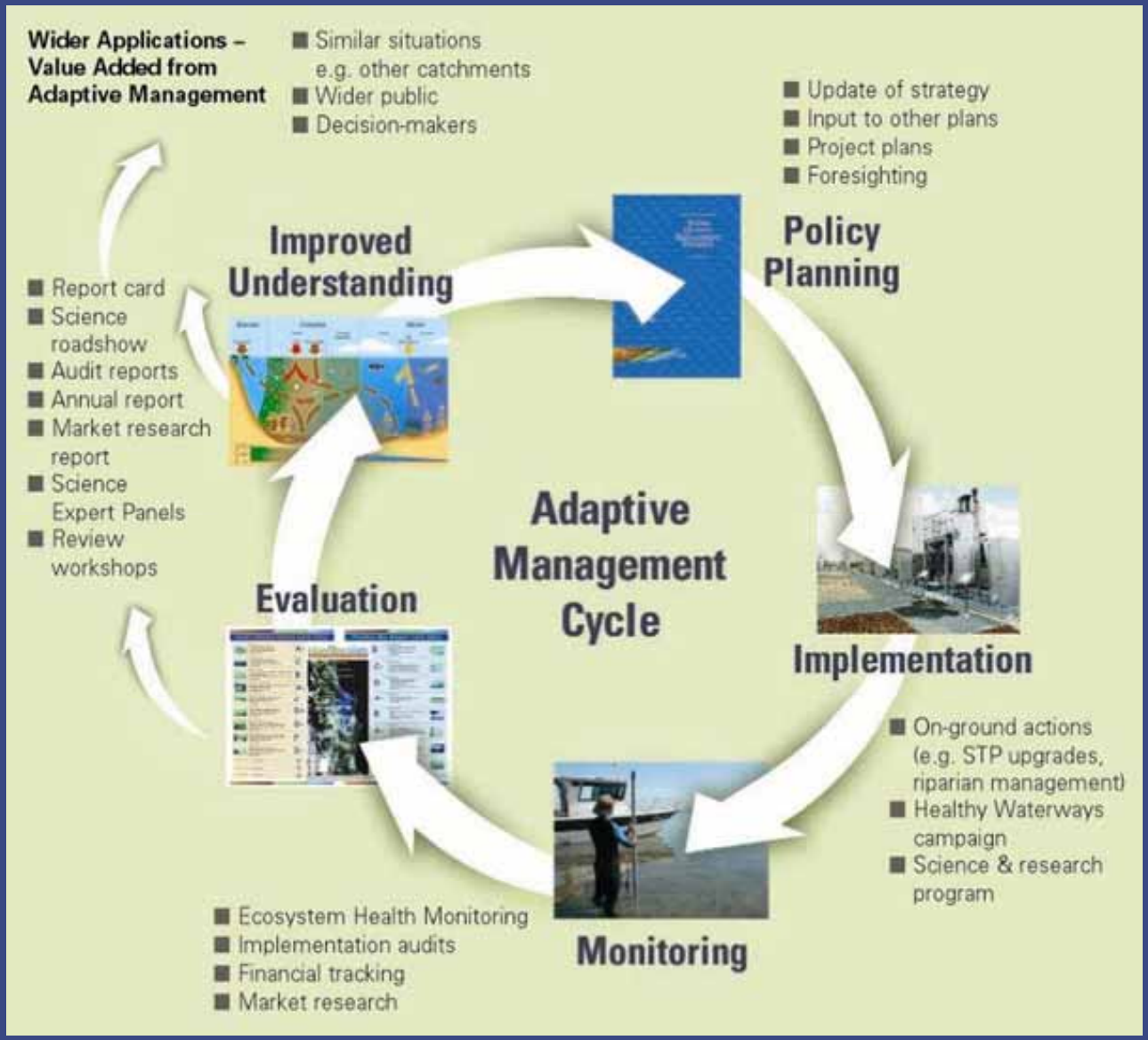
Freshwater EHMP
- Designed stage 3 ; Implemented 2002

120 freshwater sites
(sampled 2x/yr)



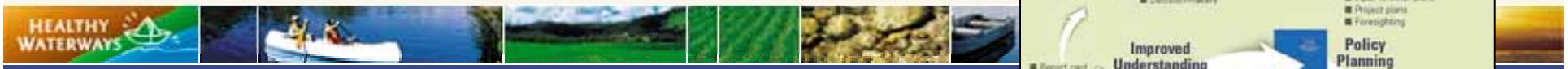
Adaptive management framework

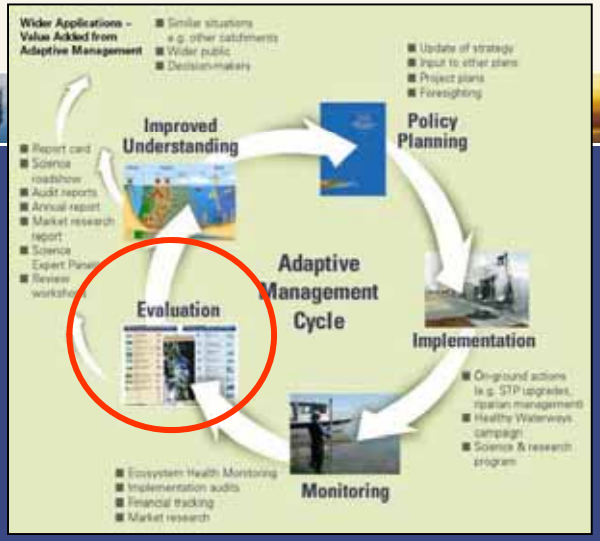


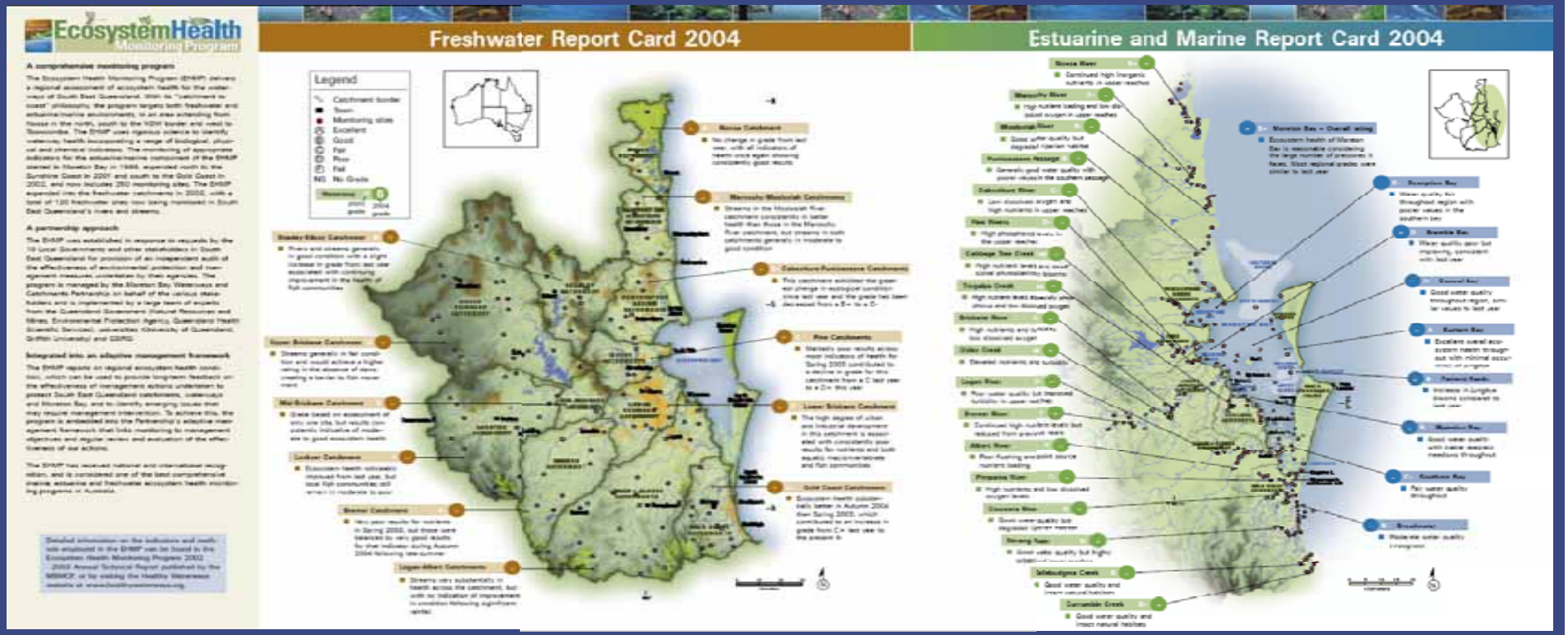


- ongoing knowledge acquisition
- critical role of monitoring
- continuous improvement in the identification and implementation of management.
- effective communication of knowledge for policy/planning

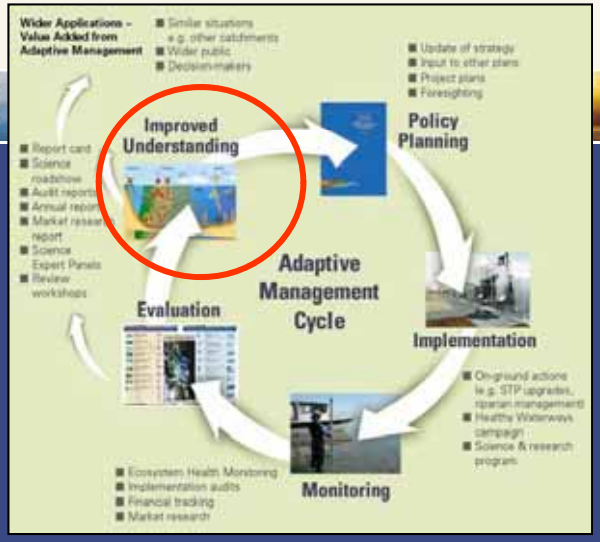
Report cards on progress

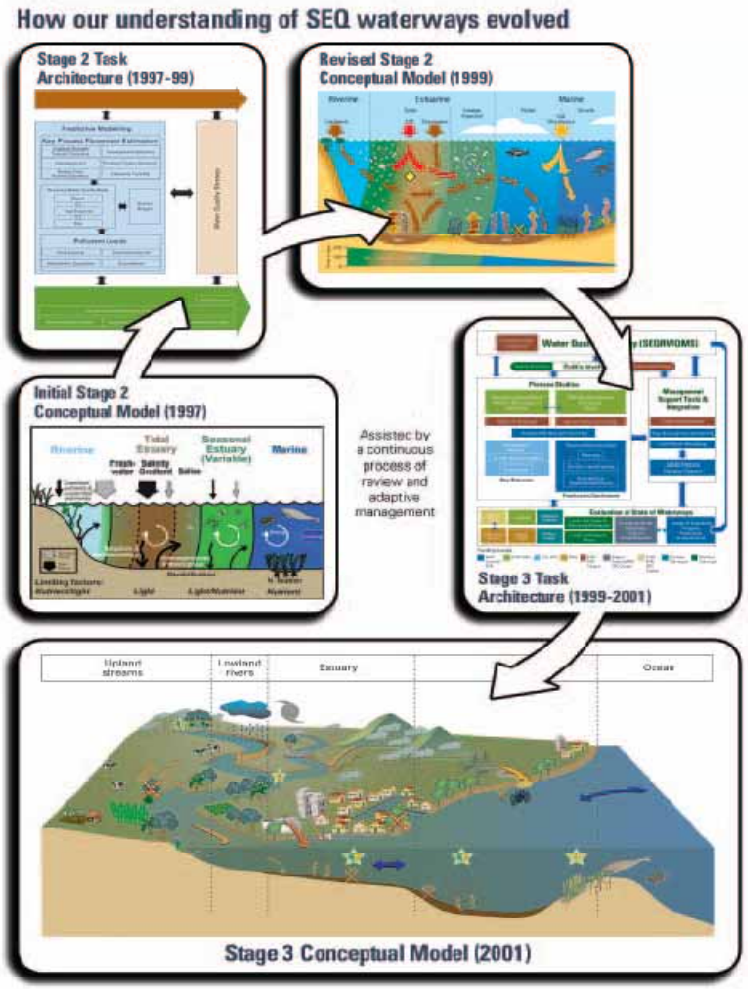






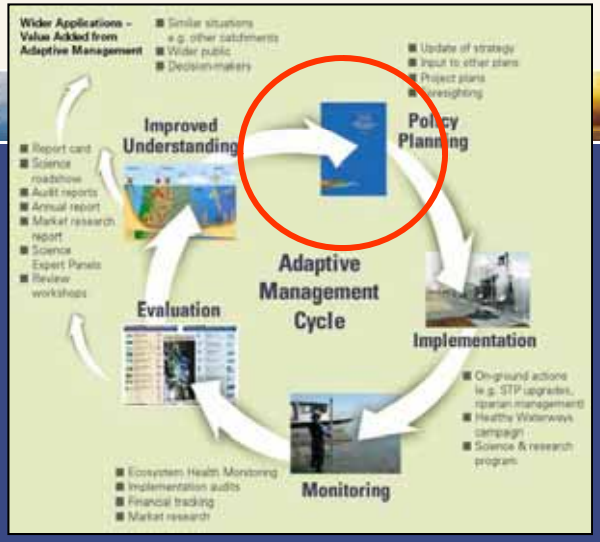
Improvement of understanding

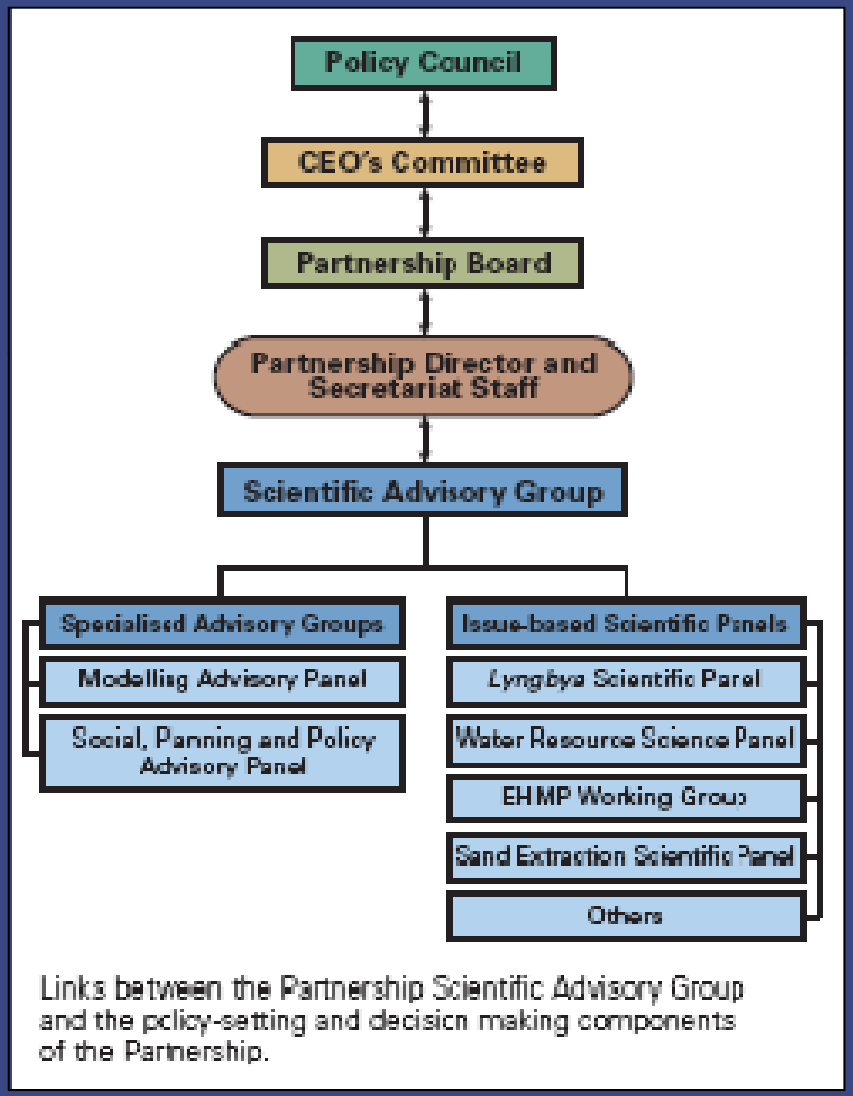




Continual refinement and testing of conceptual models

Links to policy





Links between the Partnership Scientific Advisory Group and the policy-setting and decision making components of the Partnership.

Strong link between science and policy makers

Summary - Key lessons

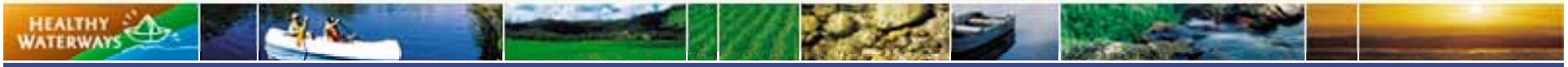
Common Vision

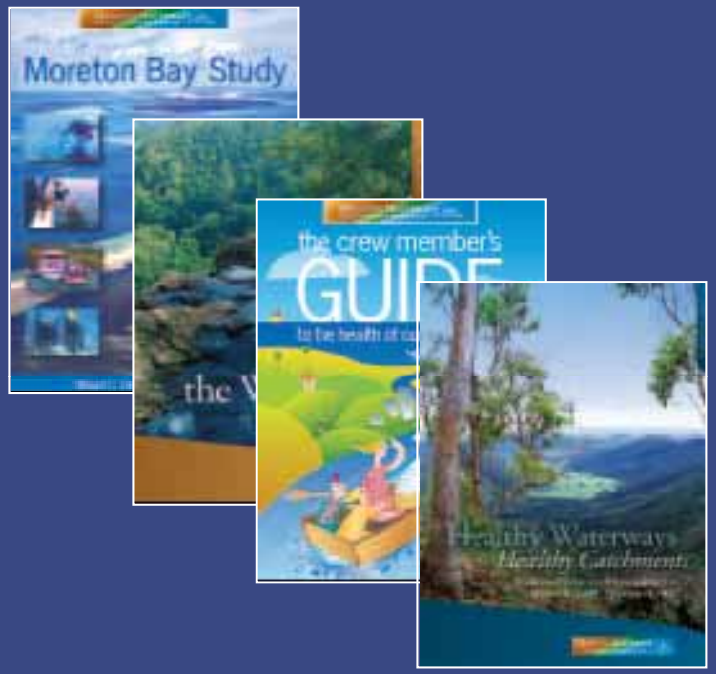
HEALTHY WATERWAYS

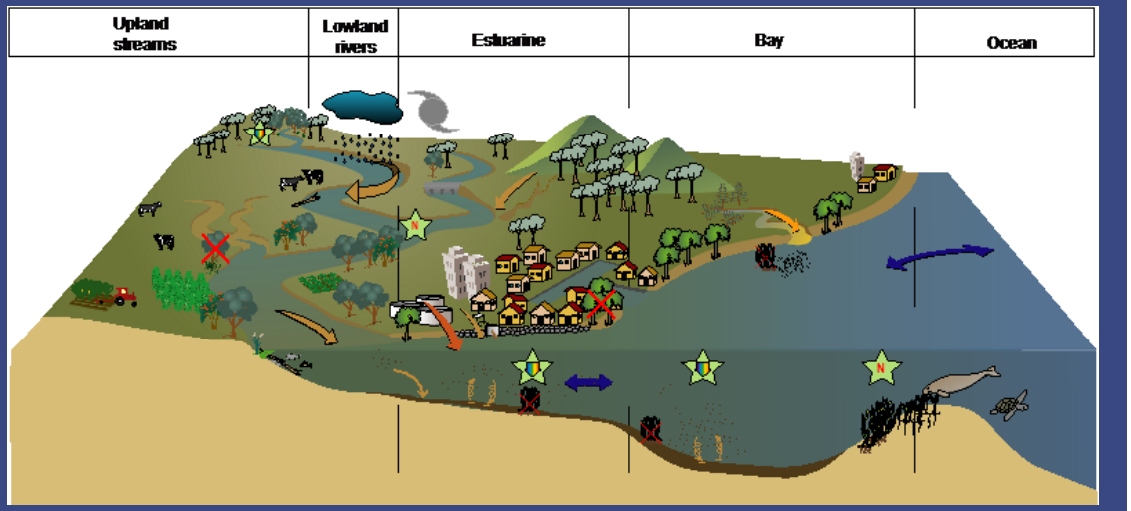
Because we're all in the same boat

Committed Individuals

Defensible science and effective communication







Examples of Recovery Evaluation Objectives in the Western U.S.

Delta Stewardship Council

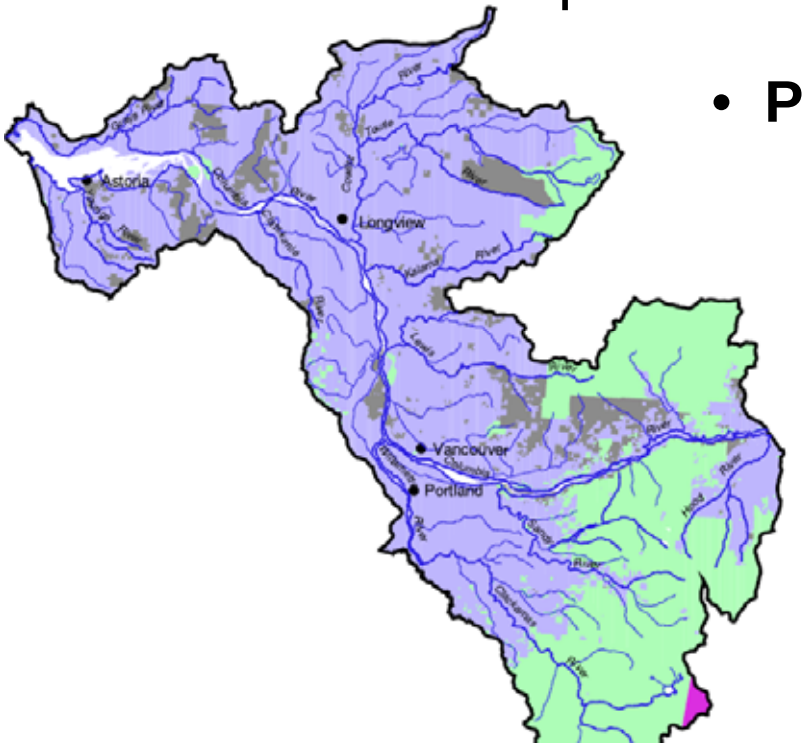
Presentation by the Independent Consultant

January 27, 2011

ARCADIS

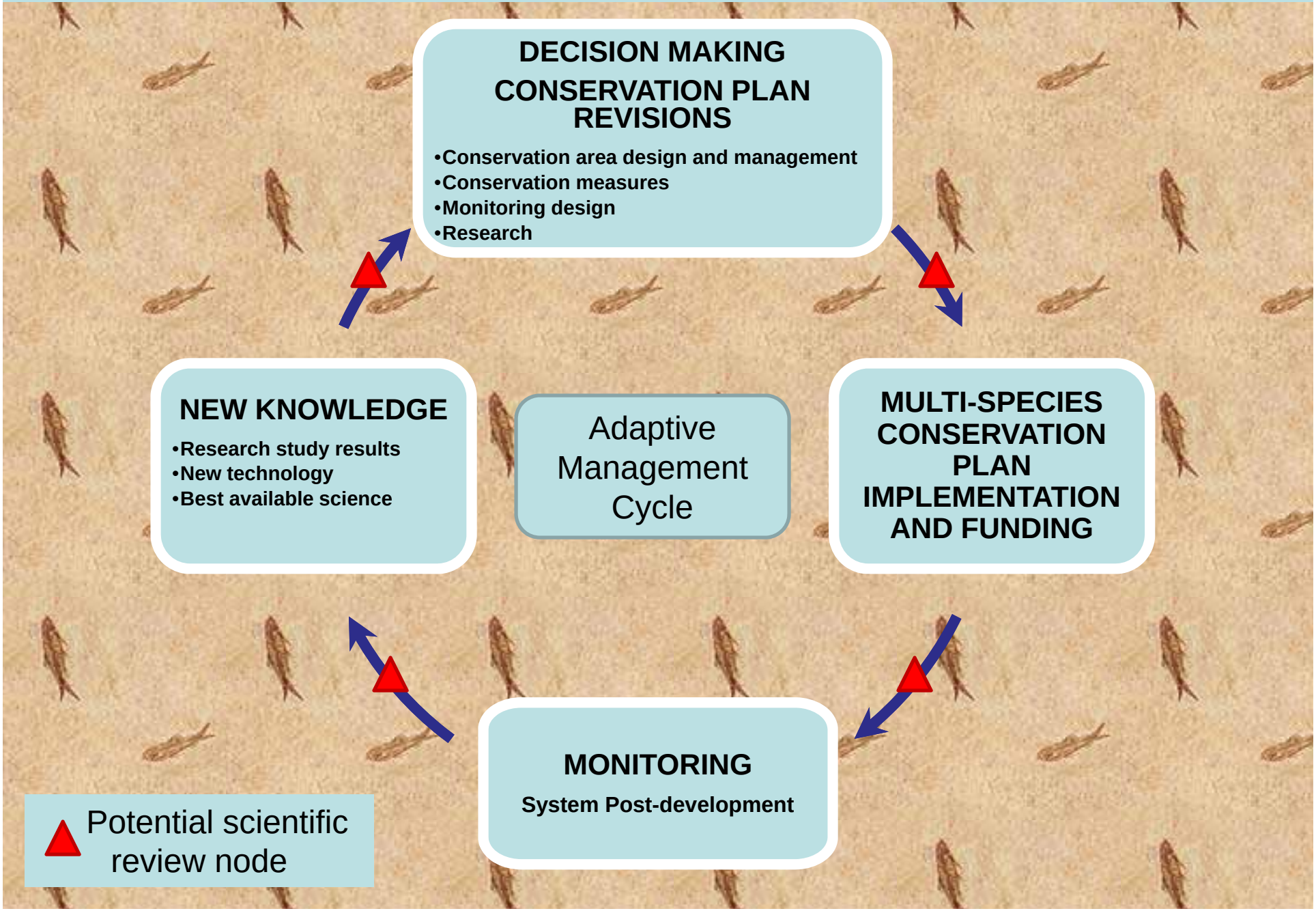
Lower Columbia River Recovery and Subbasin Plan (1991-present)

- Science based objectives linked to restoration actions
- NOAA Viable Salmonid Population (VSP) framework for recovery objectives and status assessments
- Salmon/Steelhead Population Attributes – *abundance, productivity, and viability*
- Plan includes specific **strategies**, **measures**, and **actions**



- **Priority actions** *tailored to each subbasin*:
  - *Restoring juvenile and adult passage at barriers*
  - *Restoring estuary, floodplain, and riparian habitats*
  - *Managing forests to protect and restore watershed processes*
  - *Addressing immediate risks with short term habitat fixes*

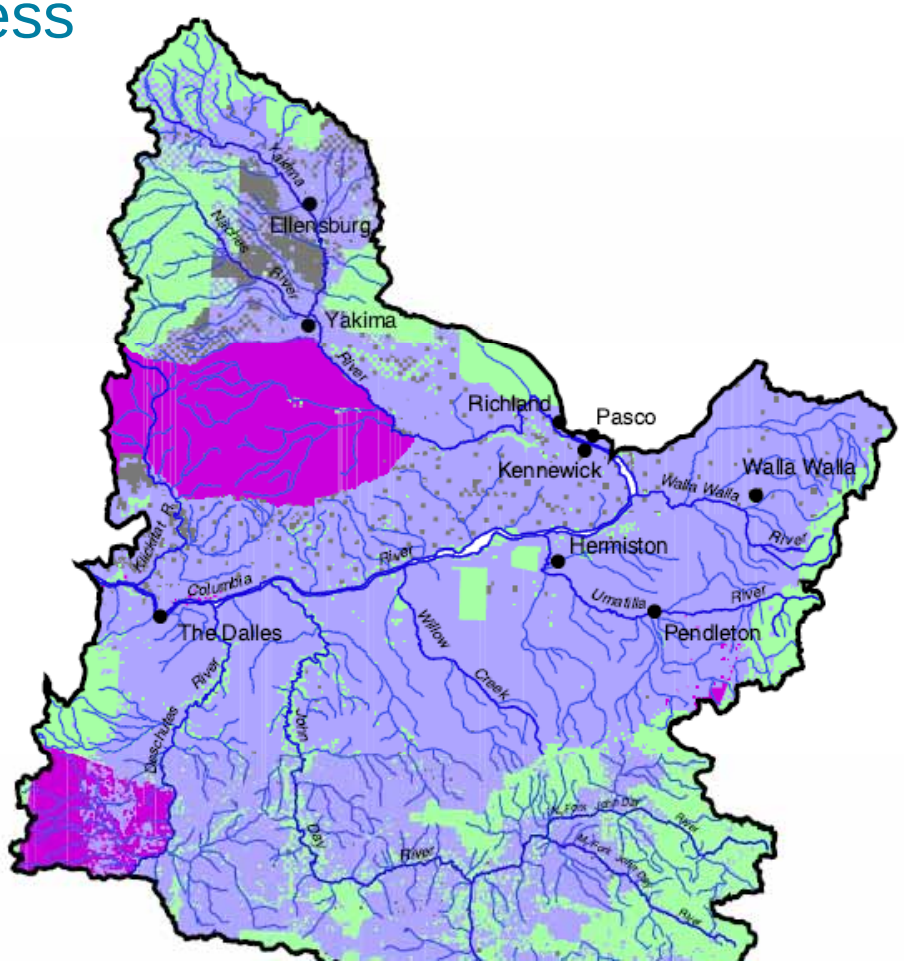
Lower Columbia River Adaptive Management



Lower Columbia River Recovery and Subbasin Plan - Monitoring

Regional agencies monitor two aspects of performance:

- **Programmatic performance measures** - used to track implementation and effectiveness
- **Biological and environmental performance measures** - *used to track and evaluate restoration actions, to evaluate effectiveness and reduce uncertainty*



Lower Columbia River Recovery and Subbasin Plan - Monitoring

Biological status monitoring

- Population parameters (*distribution, abundance, productivity, and diversity*)

Habitat status monitoring

- Habitat type, extent, quality and use

Action effectiveness monitoring

- Monitors performance of management actions (measures response vs. intended effect)

Implementation and compliance monitoring

- Monitors actions implemented

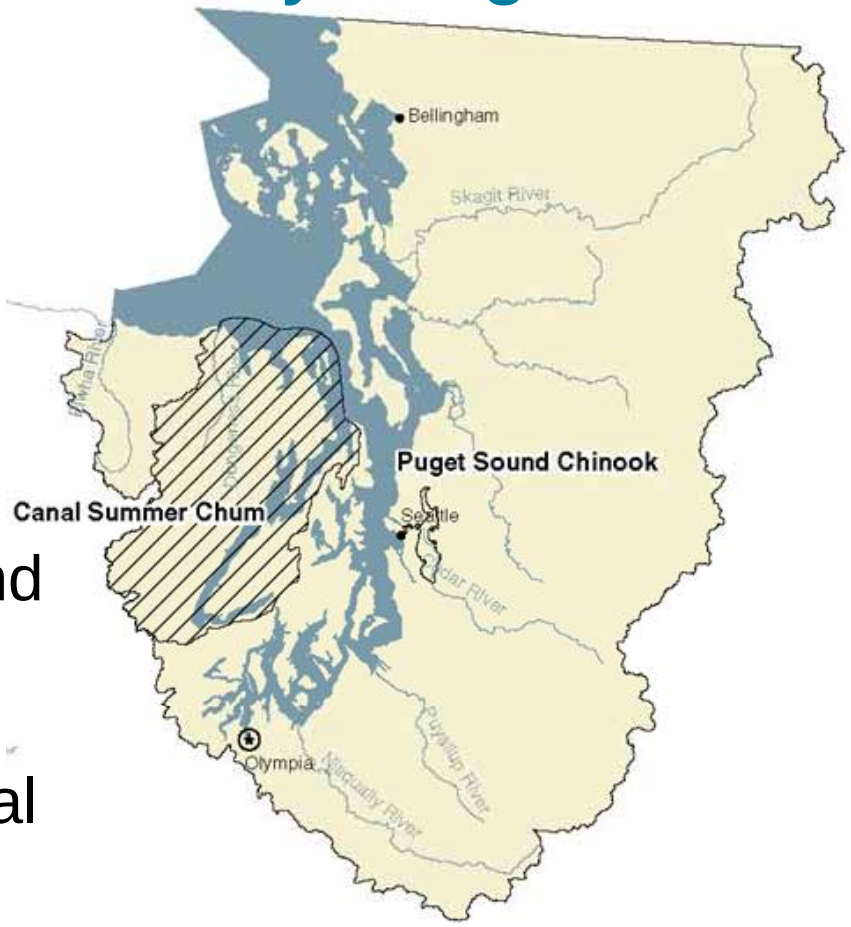
Specific Evaluations Supporting Ecosystem Recovery Objectives

- Extent and quality of habitat
  Do habitats exhibit the ecological functions to support salmon recovery ?
- Current fish use
  Are fish using those habitats ?
- Protection of critical habitats
  Are there effective protection programs ?
- Habitat acquisition programs
  Is there enough existing habitat to support species recovery ?
- Water quantity and timing of in-stream flows
  Are water flows sufficient in the streams and rivers ?
- Water quality
  Is the water contaminated ?

Puget Sound Salmon Recovery Program

Vision

- Watershed based strategy supporting long-term functional ecosystem recovery, population viability, and stewardship



Goals and Objectives

- Protect and restore nearshore and marine ecosystem processes
- Measure the viability of salmon populations and supporting critical habitats
- Develop strategies and actions to accomplish recovery
- Design regulatory programs to support protection of functioning habitats and processes

Puget Sound Recovery Program Habitat Specific Monitoring Needs

Lower Colorado River Multi-Species Planning

Terrestrial species objectives

- Avoid/minimize/mitigate adverse impacts to covered species
- Create/maintain target habitat acreages for each species

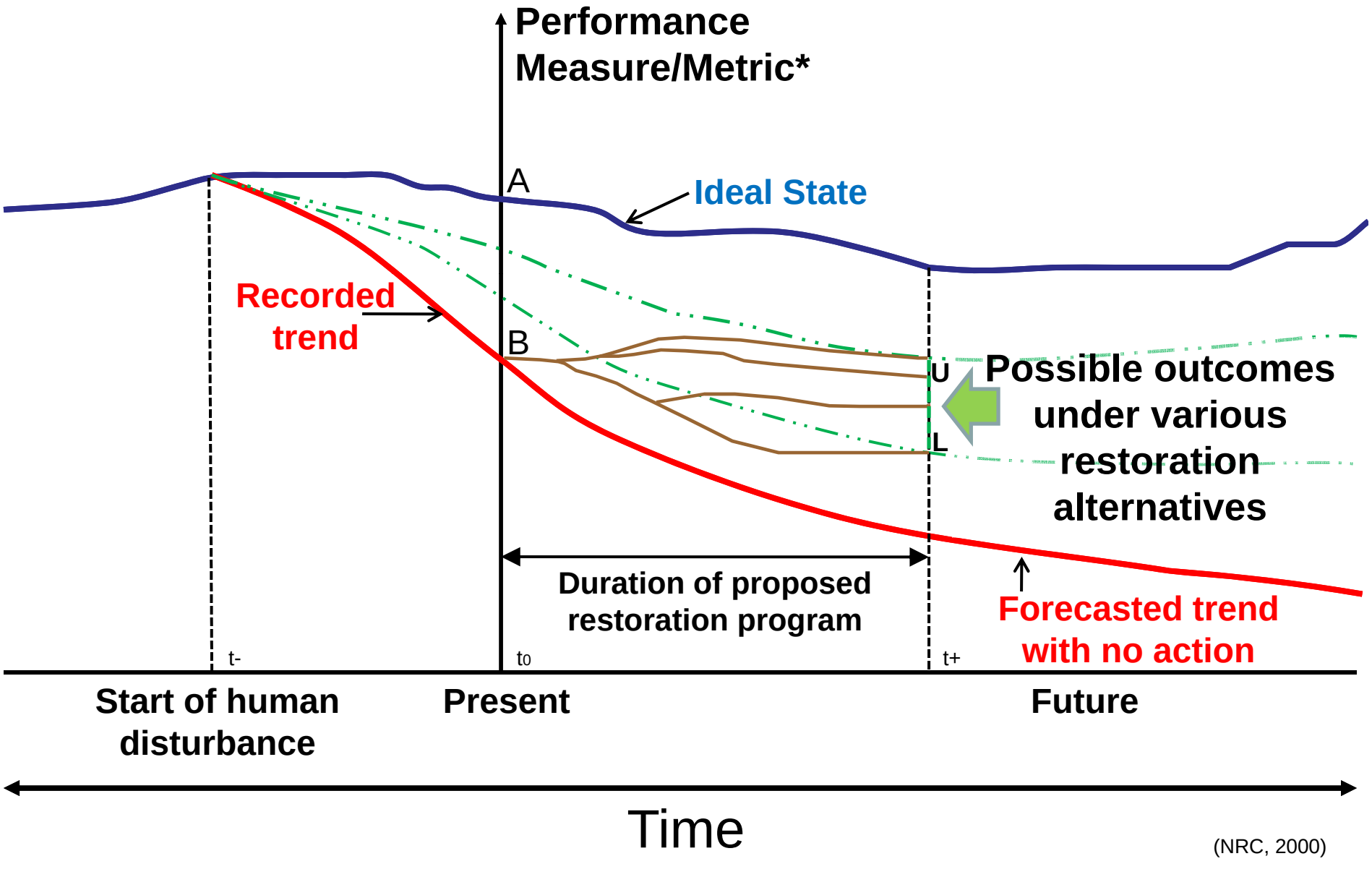
Aquatic species objectives

- Avoid/minimize/mitigate adverse impacts to covered species
- Create/maintain target habitat acreages and release target number of hatchery reared juvenile fish

Avian and botanical species objectives

- Avoid/minimize/mitigate adverse impacts to covered species
- Create/maintain target habitat acreages for covered species

Projecting and Assessing Performance of Restoration Scenarios



(NRC, 2000)

Guiding Principles for Estuary Restoration

- Protect first – restore second
- Do no harm
- Use natural processes to restore/maintain structure
- Incorporate fish life history
- Re-establish ecosystem connectivity and complexity
- Use history as a guide, but recognize irreversible change
- Establish performance criteria based on objectives and monitor
- Use best available science and employ a scientific peer-review process

(Simenstad and Bottom 2002)

Desirable Delta Habitat Conditions

	Ecosystem Component	Action
1	Internal tidally mixed Delta flows	Create upstream-downstream mixing without cross Delta flows
2	Slough networks	Create natural drainage systems for marsh habitats
3	River inflows	Develop fish-friendly flow regime
4	Tidal marsh	Expand tidal marsh throughout Delta and Suisun Marsh
5	Open water	Flood subsided islands in the Delta and diked marshlands in Suisun Marsh
6	Variable salinity	Manipulate hydrodynamic regime where possible
7	Native species abundance	Take species-specific actions
8	Activated floodplains	Expand floodplain habitat and increase frequency of flooding
9	Water quality	Reduce inputs of urban/agricultural pollutants
10	Cooler summer habitats	Expand tidal marshes in areas with cooler water temperatures

(Moyle et al. 2010)